

**PetroShale, Inc. – Various Well Sites
Partial Compliance Evaluation (PCE)
On-Site Clean Air Act (CAA) Inspections**

Inspection Date: June 19, 2018

Inspection Report Date: February 11, 2018

EPA Representatives: Bob Gallagher – EPA Region 8
Bill Squier – EPA NEIC
Doreen Au – EPA NEIC

Tribal Representatives: Bird Lockwood – MHA Energy

Parent Company Name: PetroShale, Inc.

Environmental Contact: Mike Wood
Phone number: (303) 297-1407

Parent Company Address: 303 E. 17th Avenue, Suite 940
Denver, CO 80203

Inspection Report Prepared By: Bob Gallagher

Inspection Report Reviewed By: Scott Patefield

Applicable Rules: Fort Berthold Indian Reservation (Mandan, Hidatsa and Arikara Nation), North Dakota (Fort Berthold FIP)

Observations

The EPA and MHA Energy inspected numerous PetroShale, Inc. (PetroShale) well sites/pads and attempted to detect natural gas emissions using infrared (IR) cameras and the Geospatial Measurement of Air Pollutants (GMAP) mobile unit. The inspections were conducted at locations with new wells, at facilities with previously noted emissions, and in specific areas on the Fort Berthold Indian Reservation. See Appendix A for more location details.

Appendix A also includes a table with inspection details for each site visited and the wells associated with each pad.

Bird Lockwood of MHA Energy accompanied EPA staff onsite at the locations for inspections on June 19, 2018. EPA staff used a FLIR IR camera as well as the GMAP mobile monitoring to determine emissions and measure concentrations of methane (CH₄), benzene, and toluene. MHA Energy staff used an Opgal IR camera to detect emissions at the well pad sites.

Inspection Information

EPA inspectors scanned well sites located on the Fort Berthold Indian Reservation (FBIR) for detectable emissions using an IR camera and using the GMAP. Specifically, EPA and MHA Energy inspectors scanned for detectable emissions from crude and/or water storage tanks, generators, flares, and piping at

the well pads. EPA focused on newly constructed wells where emissions are more likely to be observed. Additionally, at the FBIR sites, EPA observed flares with the IR camera to determine if the flares appeared to be in compliance with Fort Berthold FIP applicable requirements. Please be advised that this inspection report is finalized, but that the report is not a final determination of compliance.

Fort Berthold FIP Applicability

Based on drilling information reported to the NDIC well index by PetroShale, the well sites listed in Appendix A were completed after the August 12, 2007 applicability date (per 40 C.F.R. § 49.4161) and are producing from the Bakken Pool (per 40 C.F.R. § 49.4163(a)(1)) and are thus subject to the Fort Berthold FIP (See Table 1).

Closed Vent System Equipment Requirements [§49.4165(b)(1)]

“Each closed-vent system must route all produced natural gas and natural gas emissions from production and storage operations to the natural gas sales pipeline or the control devices...”. The EPA, using an IR camera, inspected each facility to ensure all emissions are being routed from the storage tanks to the emissions control device. As an area of concern, the IR camera detected emissions from tanks on the PetroShale US 14H pad.

Closed Vent System Equipment Requirements [§49.4165(b)(3)]

“Each closed-vent system must be designed to operate with no detectable natural gas emissions.” The EPA, using an IR camera, inspected each closed-vent system to ensure that there were no detectable emissions. As an area of concern, the GMAP mobile monitors detected emissions of methane and benzene on the PetroShale US 14H pad.

Utility Flares [§49.4165(c)(6)(i)]

“The owner or operator must ensure that each enclosed combustor and utility flare is: (i) Operated properly at all times that produced natural gas and/or natural gas emissions are routed to it.” EPA looked at each utility flare for any indication that the utility flare was not being operated properly.

Utility Flares [§49.4165(6)(vii)]

“The owner or operator must ensure that each enclosed combustor and utility flare is: (vii) Operated with no visible smoke emissions.” EPA looked at each utility flare for any indication of visible smoke emissions.

Areas of Concern

The following areas of concern were noted:

- The IR camera detected emissions from tanks on the PetroShale US 14H pad.
- The GMAP mobile monitors detected emissions of methane and benzene on the PetroShale US 14H pad.

Table 1 - Requirements Applicable to Inspection Observations

Regulation	Requirement Type	Regulatory Text
Fort Berthold FIP	Control Equipment Requirements – Covers	<p>§49.4165(a): (a) Covers. Each owner or operator must equip all openings on each produced oil storage tank and produced water storage tank interconnected with produced oil storage tanks with a cover to ensure that all natural gas emissions are efficiently being routed through a closed-vent system to a vapor recovery system, an enclosed combustor, a utility flare, or a pit flare. (1) Each cover and all openings on the cover (e.g., access hatches, sampling ports, pressure relief valves (PRV), and gauge wells) shall form a continuous impermeable barrier over the entire surface area of the produced oil and produced water in the storage tank.</p> <p>(2) Each cover opening shall be secured in a closed, sealed position (e.g., covered by a gasketed lid or cap) whenever material is in the unit on which the cover is installed except during those times when it is necessary to use an opening as follows:</p> <p>(i) To add material to, or remove material from the unit (this includes openings necessary to equalize or balance the internal pressure of the unit following changes in the level of the material in the unit);</p> <p>(ii) To inspect or sample the material in the unit; or</p> <p>(iii) To inspect, maintain, repair, or replace equipment located inside the unit.</p> <p>(3) Each thief hatch cover shall be weighted and properly seated.</p> <p>(4) Each PRV shall be set to release at a pressure that will ensure that natural gas emissions are routed through the closed-vent system to the vapor recovery system, the enclosed combustor, or the utility flare under normal operating conditions.</p>
Fort Berthold FIP	Control Equipment Requirements – Closed-vent systems	<p>(b) Closed-vent systems. Each owner or operator must meet the following requirements for closed-vent systems:</p> <p>(1) Each closed-vent system must route all produced natural gas and natural gas emissions from production and storage operations to the natural gas sales pipeline or the control devices required by paragraph (a) of this section.</p> <p>(2) All vent lines, connections, fittings, valves, relief valves, or any other appurtenance employed to contain and collect natural gas, vapor, and fumes and transport them to a natural gas sales pipeline and any VOC control equipment must be maintained and operated properly at all times.</p> <p>(3) Each closed-vent system must be designed to operate with no detectable natural gas emissions.</p> <p>(4) If any closed-vent system contains one or more bypass devices, except as provided for in paragraph (b)(4)(iii) of this section, that could be used to divert all or a portion of the natural gas emissions, from entering a natural gas sales pipeline and/or any control devices, the owner or operator must meet the one of following requirements for each bypass device:</p> <p>(i) At the inlet to the bypass device that could divert the natural gas emissions away from a natural gas sales pipeline or a control device and into the atmosphere, properly install, calibrate, maintain, and operate a natural gas flow indicator that is capable of taking continuous readings and sounding an alarm when the bypass device is open such that natural gas emissions are being, or could be, diverted away from a natural gas sales pipeline or a control device and into the atmosphere;</p> <p>(ii) Secure the bypass device valve installed at the inlet to the bypass device in the non-diverting position using a car-seal or a lock-and-key type configuration;</p> <p>(iii) Low leg drains, high point bleeds, analyzer vents, open-ended valves or lines, and safety devices are not subject to the requirements applicable to bypass devices.</p>

Table 1 - Requirements Applicable to Inspection Observations

Regulation	Requirement Type	Regulatory Text
Fort Berthold FIP	Control Equipment Requirements – Enclosed combustors and utility flares	<p>(c) Enclosed combustors and utility flares. Each owner or operator must meet the following requirements for enclosed combustors and utility flares:</p> <p>(1) For each enclosed combustor or utility flare, the owner or operator must follow the manufacturer's written operating instructions, procedures and maintenance schedule to ensure good air pollution control practices for minimizing emissions;</p> <p>(2) For each enclosed combustor or utility flare, the owner or operator must ensure there is sufficient capacity to reduce the mass content of VOC in the produced natural gas and natural gas emissions routed to it by at least 98.0 percent for the minimum and maximum natural gas volumetric flow rate and BTU content routed to the device;</p> <p>(3) Each enclosed combustor or utility flare must be operated to reduce the mass content of VOC in the produced natural gas and natural gas emissions routed to it by at least 98.0 percent;</p> <p>(4) The owner or operator must ensure that each utility flare is designed and operated in accordance with the requirements of 40 CFR 60.18(b) for such flares, except for §60.18(c)(2) and (f)(2) for those utility flares operated with an electronically controlled automatic igniter.</p> <p>(5) The owner or operator must ensure that each enclosed combustor is:</p> <p>(i) A model demonstrated by a manufacturer to meet the VOC destruction efficiency requirements of §§49.4161 through 49.4168 using the procedure specified in 40 CFR part 60, subpart OOOO at §60.5413(d) by the due date of the first annual report as specified in §49.4168(b); or</p> <p>(ii) Demonstrated to meet the VOC destruction efficiency requirements of §§49.4161 through 49.4168 using EPA approved performance test methods specified in 40 CFR part 60, subpart OOOO at §60.5413(b) by the due date of the first annual report as specified in §49.4168(b).</p> <p>(6) The owner or operator must ensure that each enclosed combustor and utility flare is:</p> <p>(i) Operated properly at all times that produced natural gas and/or natural gas emissions are routed to it;</p> <p>(ii) Operated with a liquid knock-out system to collect any condensable vapors (to prevent liquids from going through the control device);</p> <p>(iii) Equipped with a flash-back flame arrestor;</p> <p>(iv) Equipped with one of the following:</p> <p>(A) A continuous burning pilot flame.</p> <p>(B) An electronically controlled automatic igniter;</p> <p>(v) Equipped with a monitoring system for continuous recording of the parameters that indicate proper operation of each enclosed combustor, utility flare, continuous burning pilot flame, and electronically controlled automatic igniter, such as a chart recorder, data logger or similar devices;</p> <p>(vi) Maintained in a leak-free condition; and</p> <p>(vii) Operated with no visible smoke emissions.</p>

Table 1 - Requirements Applicable to Inspection Observations

Regulation	Requirement Type	Regulatory Text
Fort Berthold FIP	Control Equipment Requirements – Pit flares	<p>(d) Pit Flares. Each owner or operator must meet the following requirements for pit flares:</p> <p>(1) The owner or operator must develop written operating instructions, operating procedures and maintenance schedules to ensure good air pollution control practices for minimizing emissions from the pit flare based on the site-specific design.</p> <p>(2) The owner or operator must only use a pit flare for the following operations:</p> <p>(i) To control produced natural gas and natural gas emissions during well completion operations or recompletion operations;</p> <p>(ii) To control produced natural gas and natural gas emissions in the event that natural gas recovered for pipeline injection must be diverted to a backup control device because injection is temporarily infeasible and there is no operational enclosed combustor or utility flare at the oil and natural gas production facility. Use of the pit flare for this situation is limited to a maximum of 500 hours in any twelve (12) consecutive months; or</p> <p>(iii) Control of standing, working, breathing, and flashing losses from the produced oil storage tanks and any produced water storage tank interconnected with the produced oil storage tanks if the uncontrolled potential VOC emissions from the aggregate of all produced oil storage tanks and produced water storage tanks interconnected with produced oil storage tanks is less than, and reasonably expected to remain below, 20 tons in any consecutive 12-month period.</p> <p>(3) The owner or operator must only use the pit flare under the following conditions and limitations:</p> <p>(i) The pit flare is operated to reduce the mass content of VOC in the produced natural gas and natural gas emissions routed to it by at least 90.0 percent;</p> <p>(ii) The pit flare is operated in accordance with the site-specific written operating instructions, operating procedures, and maintenance schedules to ensure good air pollution control practices for minimizing emissions;</p> <p>(iii) The pit flare is operated with no visible smoke emissions;</p> <p>(iv) The pit flare is equipped with an electronically controlled automatic igniter;</p> <p>(v) The pit flare is visually inspected for the presence of a flame anytime produced natural gas or natural gas emissions are being routed to it. Should the flame fail, the flame must be relit as soon as safely possible and the electronically controlled automatic igniter must be repaired or replaced before the pit flare is utilized again; and</p> <p>(vi) The owner or operator does not deposit or cause to be deposited into a flare pit any oil field fluids or oil and natural gas wastes other than those designed to go to the pit flare.</p>
Fort Berthold FIP	Control Equipment Requirements – Other Control Devices	<p>(e) Other Control Devices. Upon prior written approval by the EPA, the owner or operator may use control devices other than those listed above that are determined by EPA to be capable of reducing the mass content of VOC in the natural gas routed to it by at least 98.0 percent, provided that:</p>

Table 1 - Requirements Applicable to Inspection Observations

Regulation	Requirement Type	Regulatory Text
		<p>(1) In operating such control devices, the owner or operator must follow the manufacturer's written operating instructions, procedures and maintenance schedule to ensure good air pollution control practices for minimizing emissions; and</p> <p>(2) The owner or operator must ensure there is sufficient capacity to reduce the mass content of VOC in the produced natural gas and natural gas emissions routed to such other control devices by at least 98.0 percent for the minimum and maximum natural gas volumetric flow rate and BTU content routed to each device.</p> <p>(3) The owner or operator must operate such a control device to reduce the mass content of VOC in the produced natural gas and natural gas emissions routed to it by at least 98.0 percent.</p>

APPENDIX A: Inspection Details

Date	Wellpad Permit No	Current Well Name	PCE/FCE	IR Camera Footage Taken File #	GMAP File	Emissions Measured by GMAP
6/19/2018	33202	PETROSHALE US 14H	PCE (Did not assess engines)	MOV_0127	180619-MA08	CH4 = 30.8 ppm Benz = 234 ppb
	33204	PETROSHALE US 13H		MOV_0128		
	33010	PETROSHALE US 12H				
	33011	PETROSHALE US 11H				
	33203	PETROSHALE US 18H				
	33007	PETROSHALE US 17H				
	33008	PETROSHALE US 16H				
	33009	PETROSHALE US 15H				
	32778	PETROSHALE US 10H				
	32777	PETROSHALE US 9H				
	32767	PETROSHALE US 8H				
	33001	PETROSHALE US 7H				
	33002	PETROSHALE US 6H				
	33003	PETROSHALE US 5H				
	33004	PETROSHALE US 4H				
	33005	PETROSHALE US 3H				
	33006	PETROSHALE US 2H				

APPENDIX B: IR Log

COMPANY/ OPERATOR	SITE	FILE DATE	File #.Format	PHOTO GRAPHER	DISTANCE (yds) Camera to Leak	DESCRIPTION
PetroShale	PETROSHALE US 14H	6/19/2018	MOV_0127.mp4	D. Au	Not reported	Leaking tanks, crude/produced water
PetroShale	PETROSHALE US 13H	6/19/2018	MOV_0128.mp4	D. Au	Not reported	Produced water